

CLAIMS

1. A device for levitating an object (1) by sound waves, wherein the object comprises at least one surface portion suited for levitation and arranged opposite to a sound-emitting surface,
characterized in that the device comprises the following features:
 - a rigid support structure (2) having a support structure top surface (3) for absorbing forces generated by the gravitation or acceleration of the levitating object and perpendicularly acting on said support structure top surface (3),
 - a thin oscillatory element (4) arranged in parallel to the support structure top surface,
 - vibration generating means (5) for causing the thin oscillatory element (4) to vibrate so that the oscillatory element (4) is levitating above the support structure top surface (3) without contacting it and the object (1) is levitating above the thin oscillatory element (4).
2. A device according to claim 1, characterized in that the thin oscillatory element (4) is a metal sheet (4a) or a plastic plate having similar oscillatory properties as the metal sheet, and the vibration generating means are means for generating mechanical vibrations and are coupled to the metal sheet or to the plastic plate so that the vibrations are transferred to the metal sheet or plastic plate.
3. A device according to claim 1, characterized in that the thin oscillatory element is an electrostrictive-excitabile piezofilm (4b).
4. A device according to claim 1, characterized in that the thin oscillatory element is a magnetostrictive-excitabile film (4c), wherein the material of this film comprises magnetostrictive properties, and an unit for magnetostrictive excitation is provided.

5. A device according to claim 1, characterized in that the thin oscillatory element (4) is an electrostrictive-excitabile film, wherein the material of this film comprises electrostrictive properties, and an unit for electrostrictive excitation is provided.
6. A device according to claim 2, characterized in that coupling is performed by using a mechanically fastened coupling device.
7. A device according to claim 2, characterized in that coupling is performed via an intermediate medium.
8. A device according to claim 7, characterized in that the intermediate medium is a gas.
9. A device according to claim 7, characterized in that the intermediate medium is a liquid.
10. A device according to any of the preceding claims, characterized in that the thin oscillators element is controlled so that it vibrates with different frequencies and/or amplitudes.
11. A device according to any of the preceding claims, characterized in that several oscillatory elements are arranged and are selectively controllable.

12. A device according to any of the preceding claims, characterized in that the top surface of support structure is provided with at least one suction orifice for air or gas (7) and the oscillatory element (8) is provided with at least one hole, wherein the suction conditions are set so that the object positioned above the hole is sucked and held at a determined distance to the surface of the thin oscillatory element by the air film generated by the vibrating oscillatory element.
13. A device for transporting of objects by using the device according to claims 1 to 12.
14. A gripping device using the devices according to claims 1 to 12.
15. A storing and holding device using the devices according to claims 1 to 12.
16. A bearing using the devices according to claims 1 to 12, wherein the support structure is a tube (10).
17. A method for levitating an object (1) by sound waves, wherein the object comprises at least one surface portion suited for levitation and arranged opposite to a sound-emitting surface, characterized in that
the method comprises the following steps:
 - providing of a rigid support structure (3) having a support structure top surface for absorbing forces generated by the gravitation or acceleration of the levitating object and perpendicularly acting on the support structure top surface,
 - providing of a thin oscillatory element (4) arranged in parallel to the support structure top surface (3),

- providing of vibration generating means (5) which cause the thin oscillatory element (4) to vibrate so that the oscillatory element (4) is levitating above the support structure top surface without contacting it and the object (1) is levitating above the thin oscillatory element (4) without contacting it.